CLAIMS:

1. A method for forming a hydrophobic coating on the surface of a substrate, the method comprising the steps of:
   (a) applying a mixture comprising a particulate material and a linking agent to the surface to form a coating on the surface, wherein the linking agent is capable of forming a polymer strand linking two or more particles of the particulate material and capable of forming a polymer strand linking the surface and one or more particles of the particulate material;
   (b) exposing the coating to conditions such that the linking agent forms polymer strands linking two or more particles of the particulate material, and forms polymer strands linking the surface and one or more particles of the particulate material, thereby linking the particles together and to the surface by polymer strands; and
   (c) exposing the coating to conditions effective to cause at least some of the polymer strands linking two or more particles or linking the surface and one or more particles, to cross-link with other polymer strands linking two or more particles or linking the surface and one or more particles.

2. A method for forming a hydrophobic coating on the surface of a substrate, the method comprising the steps of:
   (a) applying a mixture comprising a particulate material, a linking agent and a peroxide to the surface to form a coating on the surface, wherein the linking agent is capable of forming a polymer strand linking two or more particles of the particulate material and capable of forming a polymer strand linking the surface and one or more particles of the particulate material, and wherein the peroxide is capable of causing a peroxide catalysed cross-linking reaction between polymer strands formed by the linking agent;
   (b) exposing the coating to conditions such that the linking agent forms polymer strands linking two or more particles of the particulate material, and forms polymer strands linking the surface and one or more particles of the particulate material, thereby linking the particles together and to the surface by polymer strands; and
   (c) exposing the coating to conditions effective to cause a peroxide catalysed cross-linking reaction between at least some of the polymer strands linking two or more particles or linking the surface and one or

more particles.

3. A method according to claim 2 wherein the peroxide is selected from the group consisting of dicumyl peroxide, 2,4-dichlorobenzoyl peroxide, benzoyl peroxide, and mixtures thereof.

4. A method for forming a hydrophobic coating on the surface of a substrate, the method comprising the steps of:

(a) applying a mixture comprising a particulate material, a linking agent and a platinum catalyst to the surface to form a coating on the surface, wherein the linking agent is capable of forming a polymer strand linking two or more particles of the particulate material and capable of forming a polymer strand linking the surface and one or more particles of the particulate material, and wherein the platinum catalyst is capable of catalysing a vinyl addition cross-linking reaction to cross-link polymer strands formed by the linking agent;

(b) exposing the coating to conditions such that the linking agent forms polymer strands linking two or more particles of the particulate material, and forms polymer strands linking the surface and one or more particles of the particulate material, thereby linking the particles together and to the surface by polymer strands; and

(c) exposing the coating to conditions effective to cause a platinum catalysed vinyl addition cross-linking reaction to cross-link at least some of the polymer strands linking two or more particles or linking the surface and one or more particles.

5. A method for forming a hydrophobic coating on the surface of a substrate, the method comprising the steps of:

(a) applying a mixture comprising a particulate material, a linking agent, a polymer having terminal vinyl groups and a platinum catalyst to the surface to form a coating on the surface, wherein the linking agent is capable of forming a polymer strand linking two or more particles of the particulate material and capable of forming a polymer strand linking the surface and one or more particles of the particulate material, and wherein the platinum catalyst is capable of catalysing a vinyl addition reaction between the polymer having terminal vinyl groups and polymer strands formed by the linking agent;

(b) exposing the coating to conditions such that the linking agent forms

polymer strands linking two or more particles of the particulate material, and forms polymer strands linking the surface and one or more particles of the particulate material, thereby linking the particles together and to the surface by polymer strands; and

(c) exposing the coating to conditions effective to cause a vinyl addition reaction between the polymer having terminal vinyl groups and at least some of the polymer strands linking two or more particles or linking the surface and one or more particles.

6. A method according to claim 5 wherein the polymer having terminal vinyl groups is selected from the group consisting of vinyl terminated polydimethylsiloxane, vinyl terminated diphenylsiloxane-dimethylsiloxane copolymer, vinyl terminated trifluoropropylmethylsiloxane-dimethylsiloxane copolymer, vinylmethyloxysiloxane homopolymer and mixtures thereof.

7. A method according to any one of claims 4 to 6 wherein the platinum catalyst is selected from the group consisting of platinum divinyl complexes, platinum cyclovinyl complexes, and mixtures thereof.

8. A method for forming a hydrophobic coating on the surface of a substrate, the method comprising the steps of:

(a) applying a mixture comprising a particulate material, a linking agent, and a tin or zinc catalyst to the surface to form a coating on the surface, wherein the linking agent is capable of forming a polymer strand linking two or more particles of the particulate material and capable of forming a polymer strand linking the surface and one or more particles of the particulate material, and wherein the catalyst is capable of catalysing a condensation cross-linking reaction to cross-link polymer strands formed by the linking agent;

(b) exposing the coating to conditions such that the linking agent forms polymer strands linking two or more particles of the particulate material, and forms polymer strands linking the surface and one or more particles of the particulate material, thereby linking the particles together and to the surface by polymer strands; and

(c) exposing the coating to conditions effective to cause a condensation cross-linking reaction to cross-link at least some of the polymer strands linking two or more particles or linking the surface and one or more particles.

9. A method according to claim 8 wherein the catalyst is dibutyltin dilaurate or zinc octoate.

10. A method according to claim 8 or claim 9 wherein the mixture further comprises a trifunctional alkylsilane.

11. A method according to any one claims 1 to 10 wherein the linking agent is a polymer or mixture of polymers selected from the group consisting of hydroxy terminated vinylsiloxane polymer, hydroxy terminated polydimethylsiloxane, hydroxy terminated polydiphenylsiloxane, hydroxy terminated polyphenylmethylsiloxane, methylhydrosiloxane (and copolymers with dimethylsiloxane), vinylmethoxysiloxane homopolymer, polytrifluoropropylmethylsiloxane (silanol terminated), vinylmethylsiloxane-dimethylsiloxane copolymer (silanol terminated) and vinylmethylsiloxanes.

12. A method according to any one of claims 1 to 10 wherein the linking agent is a polymer or mixture of polymers selected from the group consisting of modified polystyrene, polyethylenes, fluorinated polymers, and triethoxysilyl modified poly-1,2-butadiene.

13. A method according to any one of claims 1 to 10 wherein the linking agent is a bifuntional or trifunctional alkylsilane.

14. A method according any one of claims 1 to 13 wherein the mixture in step (a) further comprises a chemical modifying reagent capable of reacting with at least some of the particles of the particulate material to enhance the chemical hydrophobicity of the particles.

15. A method according to claim 14 wherein the chemical modifying reagent is a compound containing one or more condensation cure groups and one or more hydrophobic groups.

16. A method according to claim 15 wherein the chemical modifying reagent is a compound of the formula $SiR^1(OR^2)_3$, where R^1 is a hydrophobic group, and each R^2 is independently selected and is methyl, ethyl or acetyl.

17. A method accordingly to any one of claims 1 to 16 wherein the particulate

material is selected from the group consisting of silica particles, particles of cementitious material, metal particles, glass particles, particles of a metal oxide, and mixtures thereof.

18. A method according to claim 17 wherein the metal oxide is titanium oxide, aluminium oxide, zirconium oxide or zinc oxide.

19. A method according to any one of claims 1 to 16 wherein the particulate material comprises silica particles.

20. A method according to claim 19 wherein the silica particles are flame hydrolysed silica particles.

21. A method according to any one of claims 1 to 20 wherein the particles of the particulate material have an average particle size of from 1 nm to 500 μm.

22. A method according to claim 21 wherein the particles of the particulate material have an average particle size in the range of from 1 nm to 100 μm.

23. A method according to claim 22 wherein the particles of the particulate material have an average particle size in the range of from 1 nm to 50 nm.

24. A method according to any one of claims 1 to 23 wherein step (b) comprises heating the coating to a temperature and for a period of time effective for the linking agent to form polymer strands linking two or more particles of the particulate material, and to form polymer strands linking the surface and one or more particles of the particulate material, thereby linking the particles together and to the surface by polymer strands.

25. A method according to any one of claims 1 to 24 wherein step (c) comprises heating the coating to a temperature of up to 150 °C for a period of time effective for at least some of the polymer strands to become cross-linked.

26. A method according to any one of claims 1 to 25 wherein steps (b) and (c) are carried out simultaneously.

27. A method according to any one of claims 1 to 25 wherein step (b) is carried out prior to step (c).

28. A method according to any one of claims 1 to 27 wherein the contact angle of water on the coating formed by the method is at least 150°.

29. A method according to any one of claims 1 to 28 wherein the contact angle of water on the coating formed by the method is at least 160°.

30. A hydrophobic coating produced by the method according to any one of claims 1 to 29.

31. An object having a surface at least a portion of which is coated with a hydrophobic coating formed by the method according to any one of claims 1 to 29.

32. A hydrophobic coating comprising particles of a particulate material bound together and to the surface by polymer strands, wherein at least some of the polymer strands are cross-linked.

33. A hydrophobic coating according to claim 32 wherein the particulate material is selected from the group consisting of silica particles, particles of cementitious material, metal particles, glass particles, particles of a metal oxide, and mixtures thereof.

34. A hydrophobic coating according to claim 32 or 33 wherein the particulate material comprises particles having an average particle size of from 1 nm to 500 μm.

35. A hydrophobic coating according to any one of claims 32 to 34 formed by the method defined by any one of claims 1 to 29.